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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/722,583	11/28/2000	Jun Sik Lee	0465-0758P	5244

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EXAMINER

KEBEDE, BROOK


ART UNIT

PAPER NUMBER

2823

DATE MAILED: 11/07/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/722,583	<b>Applicant(s)</b> LEE, JUN SIK 	
	<b>Examiner</b> Brook Kebede	<b>Art Unit</b> 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 21 October 2002.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2,4,5 and 7-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,5 and 7-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
     If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☐ All    b) ☐ Some \*    c) ☐ None of:  
         1. ☐ Certified copies of the priority documents have been received.  
         2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
         3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
     \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
     a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 21, 2002 has been entered.

### ***Drawings***

2. The formal drawings filed on September 19, 2002 have been placed of record in the file.
3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Claim 1 recites the limitation "depositing a conductive layer on a substrate" in line 2. The conductive layer (i.e. 106 or 106a) was not deposited on the substrate. As Figs. 2C-2E, show, the conductive layer formed on the barrier film (105) where in the region of the insulating film (101) and the plug (102). Therefore, "forming a conductive layer on a substrate" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art (1A-1E) in view of Wong et al. (US/6,372,150).

Re claim 1, Applicant's admitted prior art essentially discloses a method for fabricating a capacitor of a semiconductor device comprising: depositing a conductive layer (16) on a barrier layer (15); forming a photoresist pattern (17) on the conductive layer (16); etching the conductive layer (16) using the photoresist pattern (17) as a mask to form a lower electrode (16a); removing the photoresist pattern (17) using an etchant; and forming a dielectric film (18) and an upper electrode (19) on a surface of the lower electrode (16a) (see Admitted prior art Figs. 1A-1E).

However, Applicant's admitted prior art does not specifically disclose the use of non-reactive etching gas with respect to the lower electrode, wherein the etching gas is one of  $H_2O$ , a mixture of  $H_2$ , and  $O_2$  in which an amount of  $H_2$  is smaller than an amount of  $O_2$ , a mixture of  $H_2O$ ,  $NH_3$ , and  $N_2$ , a mixture of  $N_2$  and  $NH_3$ , a mixture of  $NH_3$ , and  $H_2O$ , or a mixture of  $N_2$  and  $H_2O$  is used as the etching gas during removing of the photoresist pattern.

Wong et al. disclose a water vapor plasma etching of metals surfaces that facilitates a removal of organic residues or films by plasma etching metal surfaces covered with an organic material such as photoresist (see Figs. 3 and 4; Abstract; and Col. 4, line 17-18). As Wong et al. disclose, the high vapor etch allows the elimination of a subsequent dry organic material stripping step and reducing the processing time and cost while increasing yields.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to have provided applicant's admitted prior art with

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an etchant such as water vapor as taught by Wong et al. because the process would have provided elimination of a subsequent dry organic material stripping step and reducing the processing time and cost while increasing yields.

Re claim 2, as applied to claim 1 above, both Applicant's admitted prior art and Wong et al. in combination disclose all the claimed limitations including the limitation wherein the upper and lower electrodes are one of Ru, RuO, and a metal material alloyed with Ru (see Applicant's admitted prior art Fig 1C).

Re claim 4, Applicant's admitted prior art discloses a method for fabricating a capacitor of a semiconductor device comprising: forming a conductive region (not shown) on a semiconductor substrate (not shown); forming an interleaving insulating film (11) having a contact hole (not labeled) therein over the conductive region (not shown); forming a contact plug (12) within the contact hole (not labeled); forming insulating film patterns (13 14) on of the interleaving insulating film (11) to expose the contact plug (12) and the interleaving insulating film (11) adjacent to the contact plug (12); depositing a barrier film (15) and a first conductive layer (16) on the contact plug (12) and the insulating film patterns (13 14); forming a photoresist (17) over the contact plug (12) between the insulating film patterns (13 14); sequentially removing the first conductive layer (16) and the barrier layer (15) on the insulating film patterns (13 14) using the photoresist (17) as a mask, thereby forming a lower electrode (16a) and a barrier film (15) in a U-shape in cross-section; removing the photoresist (17) using an etching gas; removing the insulating film patterns (13 14); and sequentially forming a dielectric film (18) and an upper electrode (19) on the lower electrode (16a) and the barrier film (15) (see Admitted prior art Figs. 1A-1E).

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However, Applicant's admitted prior art does not specifically disclose the use of non-reactive etching gas with respect to the lower electrode, wherein the etching gas is one of  $H_2O$ , a mixture of  $H_2$ , and  $O_2$  in which an amount of  $H_2$  is smaller than an amount of  $O_2$ , a mixture of  $H_2O$ ,  $NH_3$ , and  $N_2$ , a mixture of  $N_2$  and  $NH_3$ , a mixture of  $NH_3$ , and  $H_2O$ , or a mixture of  $N_2$  and  $H_2O$  is used as the etching gas during removing of the photoresist pattern.

Wong et al. disclose a water vapor plasma etching of metals surfaces that facilitates a removal of organic residues or films by plasma etching metal surfaces covered with an organic material such as photoresist (see Figs. 3 and 4; Abstract; and Col. 4, line 17-18). As Wong et al. disclose, the high vapor etch allows the elimination of a subsequent dry organic material stripping step and reducing the processing time and cost while increasing yields.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to have provided applicant's admitted prior art with an etchant such as water vapor as taught by Wong et al. because the process would have provided elimination of a subsequent dry organic material stripping step and reducing the processing time and cost while increasing yields.

Re claim 5, as applied to claim 4 above, both Applicant's admitted prior art and Wong et al. in combination disclose all the claimed limitations including the limitation wherein the upper and lower electrodes are one of Ru,  $RuO$ , and a metal material alloyed with Ru (see Applicant's admitted prior art Fig 1C).

Re claim 7, as applied to claim 4 above, both Applicant's admitted prior art and Kadomura in combination disclose all the claimed limitations including the limitation wherein the insulating film patterns comprise an oxide film (see Fig. 1B)

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Re claim 8, as applied to claim 4 above, both Applicant's admitted prior art and Wong et al. in combination disclose all the claimed limitations including the limitation wherein the insulating film patterns are formed by stacking two insulating films (see Fig. 1B).

Re claim 9, as applied to claim 8 above, both Applicant's admitted prior art and Wong et al. in combination disclose all the claimed limitations including the limitation wherein the two insulating films are a nitride film and an oxide film (see Fig. 1B).

Re claim 10, as applied to claim 4 above, both Applicant's admitted prior art and Wong et al. in combination disclose all the claimed limitations including the limitation wherein the barrier film is only formed on the contact plug within the contact hole (see Fig. 1C).

#### *Response to Arguments*

6. Applicant's arguments with respect to claim 1, 2, 4, 5, and 7-10 have been considered but are moot in view of the new ground(s) of rejection that was necessitated by the amendment filed on September 19, 2002.

With respect to the drawing objection applicant's argued that Fig. 2C shows the future, i.e., depositing a conductive layer on a substrate. In response applicant's argument, the Examiner respectfully disagrees with applicant's contention because Fig. 2C of the instant application only shows the conductive layer (106) being formed on the barrier film (105) wherein the barrier film is conformally formed over the oxide (103) nitride (103) the plug (102) and insulating film (101) not on the substrate (10). The objection objected to under 37 CFR 1.83(a) is deemed proper.

#### *Conclusion*

7. **THIS ACTION IS MADE NON-FINAL.**

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*Correspondence*


8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brook Kebede whose telephone number is (703) 306-4511. The examiner can normally be reached on 8-5 Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Brook Kebede

*BK*  
November 1, 2002

  
Olik Chaudhuri  
Supervisory Patent Examiner  
Technology Sector 2800